

CLAIMS

1. Machine, in particular for use on aircraft, that is able to dispense hot beverages, such as coffee, American-style coffee and tea in pre-set quantities, as well as to dispense hot and cold water, the said machine having a basically parallelepipedal structure comprising: a structural panelling and a panelling forming a covering, an open front compartment in which a container or jug for beverages is housed, there being present above the said compartment a front control panel (1) and an underlying cartridge-holder drawer (2) which can be pulled out, the said machine being characterized in that it is provided with a hydraulic circuit and an electrical circuit governed by software and it comprises at least one heater (22) inside which water is made to pass only at the moment of dispensing in the form of a beverage or of hot water, the said heater (22) being correspondingly and operatively connected to the cartridge-holder drawer (2), the operativeness being obtained by means of a hydraulic actuation system which vertically forces the heater (22) to come down onto the cartridge-holder drawer (2) so as to close it basically in a sealed manner when the beverage or hot water is being dispensed.
2. Machine according to Claim 1, in which the structural panelling is U-shaped panelling (3, 3') substantially made of aluminium.
3. Machine according to Claim 1, in which the covering panelling comprises a top panel 13 and perforated rear side panels 4.
4. Machine according to the previous claims, in which the open compartment is basically delimited by the bottom wall of the cartridge-holder drawer (2), by the panelling (3, 3'), and by a plate (6) for supporting the jug.
5. Machine according to the previous claims, in which present on the wall (3') are a spring-type sensor (8) which detects the presence of the jug when this is inserted and pressed against the said sensor (8), and a dispensing spout (9) for delivery of hot or cold water.
6. Machine according to the previous claims, in which located on the wall (3'), at the bottom, is a handle (10) that can be raised or lowered so as to raise or lower correspondingly a pin which slides in guides (11) and which is designed to clamp the machine in position in the special housings provided on aircraft.

7. Machine according to the previous claim, further equipped with channel-section guides (12) located on the underside of the machine, which are designed to slide on corresponding rails present in the housings provided on aircraft.

8. Machine according to Claim 4, in which the plate (6) is slightly inclined towards the rear of the machine and has a drainage hole (6') connected to a discharge.

9. Machine according to Claim 4, in which the plate (6) rests on a load-cell system that is able to detect the presence and weight of the jug and correspondingly control filling thereof.

10. Machine according to the previous claims, further provided with a safety fixing device for the jug, basically consisting of a spring-operated shaped rod (15), the rod (15) having to be lowered manually for insertion of the jug, the latter, once it is housed on the plate (6), being held in position by the rod (15) which, being activated by the spring, comes back up.

11. Machine according to the previous claim, in which the rod (15) coming back up holds the jug pressed against the presence sensor (8).

12. Machine according to Claim 1, in which the covering panelling comprises a first, perforated, rear panel (16) and a second, structural, rear panel (17), the said latter panelling carrying a connector for water (18), an electrical connector (20) and a manually resettable circuit breaker (19).

13. Machine according to Claim 1, in which the front control panel (1) is of the touch-sensor type, with the controls of the various functions silk-screen printed on it, as follows: a) ON/OFF switch; b) "coffee" switch; c) "tea" switch; d) "hot water" switch; e) "cold water" switch; f) "blocked" indicator; g) "ready" indicator; h) "no water" indicator; i) "failure" indicator; and j) "released" indicator.

14. Machine according to Claim 1, in which the drawer (2) opens and closes in a sliding way and has two locking positions whereby, once the drawer (2) has been completely inserted into the machine, it may subsequently be pulled out only partially for inserting or removing the cartridge during normal machine operation.

15. Machine according to the previous claims, characterized in that it is made without any pressurized boiler for heating water.

16. Machine according to the previous claims, which is able to supply steam.

1 17. Machine according to the previous claims, in which two heaters are provided:
2 one for delivering hot water and hot beverages, and one for delivering steam.

1 18. Machine according to the previous claims, having the following technical
2 specifications: depth 310-390 mm; width 150-180 mm; height 290-340 mm; weight
3 11-16.7 kg; power supply 115 V, 400 Hz three-phase or 28 Vdc; power up to
4 3500 W; pressure of incoming water 0.3-5.0 bar.

1 19. Machine according to the previous claim, in which the incoming-water
2 pressure is 1.5-2.0 bar.

1 20. Machine according to the previous claims, in which the water connector (18)
2 and the electrical connector (20) are, respectively, Hansen 2KLF16^(TM) and
3 MS3106A-16S-1P^(TM).

1 21. Machine according to the previous claims, in which the printed-circuit boards
2 required for machine operation are surface-treated with a protective treatment so
3 as to withstand vibrations, be resistant to humidity, and be resistant to organic
4 contaminants.

1 22. Machine according to the previous claims, in which the electrical circuit is built
2 so as not to create any electromagnetic interference with the instrumentation on
3 board the aircraft and, at the same time, so as not to be affected by the said
4 instrumentation, by means of a filtering system which is designed basically to
5 eliminate the high-frequency components which generate electromagnetic waves.

1 23. Machine according to the previous claims, further comprising a pressure
2 sensor (101) which detects the pressure of the water entering the machine, and
3 an air valve (110) calibrated so as to prevent overpressures.

1 24. Machine according to the previous claims, further comprising a filter to prevent
2 deposition of lime at the machine inlet.

1 25. Machine according to the previous claims, further comprising at least one
2 hydraulic distributor, the said distributor being basically a parallelepipedal element
3 inside which channels are made for the passage of water, the said channels being
4 arranged in such a way as to create the appropriate connection between a
5 plurality of header-type solenoid valves. —

1 26. Machine according to the previous claim, in which the solenoid valves are of

two types, two-way ones and three-way ones, the two-way solenoid valves controlling the flow of water by opening and closing, and the three-way solenoid valves presenting a further outlet to the discharge so that, when they are in the de-energized condition or are de-energized on account of overpressure, they open to the discharge.

27. Machine according to the previous claims, further provided with a serial port of the type that may be connected to a personal computer.

28. Machine according to the previous claims, used on other means of transport, such as trains, high-speed trains, ships and the like.

29. Machine according to the previous claims, in which selection of the "coffee" function is according to the following operation steps:

6.1 press "coffee" switch

6.2 is the "water in line" condition present?

6.3 is the "low pressure in line" condition present?

6.4 is the "no water" led permanently on?

6.5 "no water" led flashing | stop

6.6 is the "temperature ready" condition present?

6.7 start-up of "10-sec timer"

6.8 is the condition "server ok" present?

6.9 is the condition "cartridge-holder in position" present?

6.10 "coffee" led flashing

6.11 does the "10-sec timer" stop? | stop

6.12 stop of "10-sec timer"

6.13 start-up of "4-min timer"

6.14 start-up of "2-sec timer"

6.15 does the "2-sec timer" stop?

6.16 is the condition "cartridge-holder in position" present?

6.17 "failure" led lights up | stop

6.18 does solenoid valve 113 deactivate?

6.19 flow meter 103 starts count

6.20 start-up of "10-sec timer"

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23 6.21 activates solenoid valves 104 and 106

24 6.22 does the "10-sec timer" stop?

25 6.23 stops pump and deactivates solenoid valves 104 and 106

26 6.24 start-up of "10-sec timer"

27 6.25 does the "10-sec timer" stop?

28 6.26 starts up pump and activates solenoid valves 104 and 106

29 6.27 does the flow meter stop count?

30 6.28 is the condition "server active" present?

31 6.29 does the "4-min timer" stops?

32 6.30 stops pump and counters and deactivates solenoid valves 106 and 112 -

33 increases by one the "coffee cycles" counter | stop

34 and coffee is dispensed in a quantity of $1.5 \text{ l} \pm 10\%$ at a temperature of
35 approximately $85^{\circ}\text{C} \pm 5^{\circ}\text{C}$ in approximately 2 min 45 sec ± 15 sec, the "coffee"
36 function being operative only if the following conditions are satisfied: - a pressure
37 sensor reads a line pressure of 0.3-5.0 bar; - a temperature probe in the
38 exchanger (22) reads a value of approximately 98°C when the function is
39 requested; - an optical sensor is ON, this meaning that the jug is present; - a first
40 microswitch is ON, this meaning that the drawer (2) is completely inserted; and - a
41 second microswitch is ON two seconds after the request for coffee, this meaning
42 that a hydraulic piston is pressing against the exchanger (22) and the drawer (2)
43 during dispensing; during delivery, if one of the aforesaid conditions is no longer
44 satisfied, with the exception of the condition regarding the temperature probe, the
45 function is immediately interrupted; end-of-delivery being controlled by a flow
46 meter; a second safety system being present, which is controlled by the force
47 sensor located underneath the plate (6) on which the jug rests and which
48 interrupts delivery by checking the weight of the jug that is being filled; in addition,
49 a 4-minute timer interrupting delivery if none of the above-mentioned devices is
50 working; the "coffee" function being also interruptible when the "coffee" switch on
51 the front control panel is pressed again.

1 30. Machine according to the previous claims, in which selection of the "t a"
2 function is according to the procedure described in the previous claim and

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3 according to the following operation steps:

4 7.1 press "tea" switch

5 7.2 is the "water in line" condition present?

6 7.3 is the "low pressure in line" condition present?

7 7.4 is the "no water" led permanently on?

8 7.5 is the "no water" led flashing? | stop

9 7.6 is the "temperature ready" condition present? | stop

10 7.7 start-up of "10-sec timer"

11 7.8 is the condition "server ok" present?

12 7.9 is the condition "cartridge-holder in position" present?

13 7.10 "tea" led flashing

14 7.11 does the "10-sec timer" stop? | stop

15 7.12 stop of "10-sec timer"

16 7.13 start-up of "4-min timer"

17 7.14 flow meter 103 starts count

18 7.15 starts up pump and activates solenoid valves 104 and 107

19 7.16 does flow meter finish count?

20 7.17 is the "server active" condition present?

21 7.18 does the "4-min" counter stop?

22 7.19 stops pumps and counters and deactivates solenoid valves 104 and 107 -

23 increases by one the "tea cycles" counter | stop.

1 31. Machine according to the previous claims, in which selection of the "hot water"

2 function is according to the following operation steps:

3 8.1 press "hot water" switch

4 8.2 is the "water in line" condition present?

5 8.3 is the "low pressure in line" condition present?

6 8.4 is the "no water" led permanently on?

7 8.5 "no water" led flashing | stop

8 8.6 is the "temperature ready" condition present? | stop

9 8.7 start-up of "20-sec timer"

10 8.8 starts up pumps and activates solenoid valves 104 and 108

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functions: "hot water", via the solenoid valve (108), "coffee", via the solenoid valve (106), "cold water", via the solenoid valve (111), and "tea", via the solenoid valve (107), part of the water bring also used to push the piston (114) together with the exchanger (22) against the cartridge-holder drawer (2), the cold water moreover passing through the pump (109) and the solenoid valve (111), which controls the "cold water" function.

34. Heater (22) made of machined anodized aluminium, having basically a plane conformation and comprising of four elements: a central element (24), inside which at least one resistor is embedded, the top and bottom surfaces of the element (24) being furrowed by grooves or coils (24e) and (24f) having a semicircular cross section and being in communication through a hole (24c), and being moreover sized, in terms of length and section, according to the amount of water that is to be heated, the central element (24) being moreover closed in a sealed manner between a further two plane elements, an overlying element (25) and an underlying element (26), the element (25) being in turn provided, on its top face, with recesses or hollows made for lightening the structure (25a), the underlying element (26) being in turn provided, on its bottom face, with a recess (26a), whilst its top face is basically plane.

35. Heater according to the previous claim, in which the water inlet and water outlet are, respectively, (25b) and (25c), the said heater (22) being correspondingly and operatively connected to a cartridge-holder drawer (2), the operativon being obtained by means of a hydraulic actuation system which vertically forces the heater (22) to come down onto the cartridge-holder drawer (2) so as to close it basically in a sealed manner when the hot water or beverage is being dispensed.

36. Heater according to the previous claim, in which the operating connection is such that the heater (22) moves along travel guides (23), assisted by the presence of springs, the said movement being produced by a hydraulic piston, the said piston being pressurized by a pump.

37. Heater according to the Claims 34-36, in which the bottom face of the element (26), provided with the recess (26a), is connected in a sealed manner to a

3 perforated plate (27), which faces and/or is in contact with the cartridge housed
4 inside the drawer (2).

1 38. Heater according to the previous claim, in which the recess (26a) has a
2 thickness of approximately 0.8 mm.

1 39. Heater according to Claims 34-38, in which the element (25) is further
2 provided with a hole (25b) for intake of water into the exchanger (22), with a
3 corresponding water-outlet hole (25c), and with a further hole (25d) for passage of
4 water to the drawer (2), the said latter hole (25d) corresponding to a further two
5 holes, (24d) and (26d), which are also directed towards the drawer (2) and are set,
6 respectively, on the element (24) and on the element (26).

1 40. Cartridge-holder drawer (2) / heater (22) assembly in which the heater is
2 according to Claims 34-39, in the said assembly the water passing as follows: the
3 water comes into the hole (25b), passes into the coil (24e), drops into the hole
4 (24c), runs along the coil (24f), returns upwards through the hole (24c), and
5 comes out of the exchanger through the hole (25c); it then goes to a solenoid
6 valve (106), returns to the hole (25d), passes through the holes (24d) and (26d),
7 and then arrives at the chamber (26a), from where it is distributed, comes out from
8 the holes in the plate (27), and drops through the cartridge in the drawer (2), from
9 which it comes out through an outlet hole.

1 41. Assembly according to Claim 40, to be used in coffee machines according to
2 Claims 1-34.

1 42. Use of the heater according to Claims 34-39 to heat liquids in coffee machines
2 according to Claims 1-33.

1 43. Use of the heater according to Claims 34-39 to heat liquids in traditional coffee
2 machines.

1 44. Use of extruded and machined-aluminium elements to build the machine
2 according to any one of the previous claims.

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